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TOWNSCAPE SYSTEM-ORIENTED ANALYSIS TECHNIQUE AS A NATURAL-TOWN PLANNING COMPLEX

Abstract. The article discloses the analysis technique of a concept “townscape” based on universal properties of systems that makes it possible to examine such properties of the townscape as base categories, structural elements, and reference norms. The system-oriented analysis of various types of the townscape is also provided; their characteristic peculiarities and properties have been revealed in the article.

Keywords: the townscape, complex systems, hierarchical levels, base categories, structural elements, reference norms, the typology of the townscape.

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МЕТОДИКА СИСТЕМНО-ОРИЕНТИРОВАННОГО АНАЛИЗА ГОРОДСКОГО ЛАНДШАФТА КАК ИНСТРУМЕНТ ПЛАНИРОВАНИЯ

Аннотация. Статья раскрывает методику анализа понятия «городской пейзаж» на основе универсальных свойств систем, что делает возможным исследование таких свойств городского пейзажа, как основные категории, структурные элементы и соответствие нормативным требованиям. Выполнен системно-ориентированный анализ различных типов городского ландшафта, его характерных особенностей и свойств.

Ключевые слова: городской пейзаж, сложные системы, иерархические уровни, базовые категории, структурные элементы, отсылочные нормы, типология городского пейзажа.

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Introduction

Acceleration of urbanization processes, and as a consequence a rapid growth of towns and urban conglomerations enables to state a global influence of a man on transformation of the earth surface. Less and less nooks remain in their natural state unaffected by human activities. The natural landscape is replaced by an anthropogenous (human caused) landscape and townscape.

According to modern researches, an artificial human environment established on the basis of natural environment as a result of its transformation is understood as a townscape.

1. Scientific Methods of Research in the Area of Landscape Science and Town Planning

When considering the present issue it should be noted that in order to study problems of landscape science and town planning it is pertinent to use general scientific methods of knowledge as the analysis and synthesis, induction and deduction, abstract and concrete, historical and logical methods of research. At the same time each of these sciences has its own special methods of research.

1.1. Universal Properties of Systems

The concept of the townscape as natural may be attributed to supersophisticated systems with good reason. Universal properties inherent to any system are applied also to this concept.

The methods of a structured system analysis have had widespread application in the landscape science — a science about natural-territorial complexes. As the townscape is an evolution stage of an anthropogenous landscape, and that in its turn develops on the basis of a natural landscape, then it is logic to extend the methods of the structured system analysis to study such concept as the townscape.

1.2. Scientific Methods in Landscape Science

The system-oriented method is used to study relations of the landscape components, the influence of landscapes on each other, building landscape models, to study their genesis, energetics, productiveness, to forecast development and finally to propose rational nature management recommendations [2].

Simultaneously with the system-oriented method other methods may be used, such as mathematical,

cartographical, a scoring system method, experimental and empiric ones and so on [3]. Development of such scientific method in the landscape science as land monitoring is aimed at data support of the stated problems, and it is an observation system over the land fund state with the aim of timely revealing changes of their assessments, preventing and eliminating negative processes and phenomena [4].

A main source of receiving information for the purpose of conducting cadaster-ecological monitoring is earth remote sensing which includes the receipt of data by applying surface, aeroprejection, satellite methods, its computer analysis, decoding, study and processing [5].

1.3. Scientific Techniques in Town Planning

One of the most important tasks of modern town planning is modeling and forecast of urban development [6]. In these latter days architectural concepts based on linguistic, semiotic, theoretical and information and other interpretations of architecture have appeared [7]. The French architect and scientist Y. Friedman uses many modern mathematical methods showing rich possibilities of their application in architectural engineering [8].

One of promising approaches to solution of architectural problems is an architectural and compositional modeling. A system-oriented technique interpreted to solve architectural problems forms the foundation of this approach.

2. The Townscape Structure

One may study the townscape as a supersophisticated system consisting of numerous components in the event that a complicated system is split into a set of simpler structures and the following most universal properties are distinguished:

- the capacity to divide into subsystems;
- to enter into higher-order systems (hierarchy);
- to possess a larger content than the sum of subsystems content;
- the availability of direct relations and feedback;
- the continuity of development;
- the structural properties that is the availability of a definite organization.

The introduction of such system concepts as hierarchic levels, base categories, structural elements, reference norms will make it possible to study the townscape in depth and in a strict and an unbiased manner.

2.1. Hierarchic Levels, Base Categories of the Townscape

In accordance with the properties of the system to exhibit hierarchy, one may distinguish the following hierarchic levels in the townscape:

- the macrolevel, which an urban agglomeration, an urbanized district, a territorial industrial complex;
- the meso-level makes it possible to distinguish townscapes different by type (the industrial landscape, the cultivated land);

- the microlevel that is a microlandscape of the courtyard, the sports ground, the vehicle-free sectors.

Artificial and natural parts of the landscape are characterized by available direct relations and feedback, such as the relation between the climate and the town planning pattern, between the relief and the space-spatial composition. The continuity of development is also a fixed property of the townscape. And in relation to this it may be said about degradation or harmonization of the townscape, that is about deterioration or improvement of its properties.

To solve a main task of the present study being harmonization of the townscape, the meso-level is of the most interest in a general hierarchy of townscapes. With regard to this middle level (meso-level) in order to study the townscape we propose to distinguish and analyze the following provisions:

- 1) Base categories of the townscape: a) historical; b) natural;
- 2) Structural elements of the townscape: a) anthropogenous (human caused); b) natural.

Reference norms and functions of the townscape

The cultural landscape is formed under the influence of viable human economic activities such as agricultural land development, construction of roads, melioration and irrigation.

The most primary elements fixed in the natural landscape by a man were named base categories of the cultural landscape. As the base categories of the cultural landscape A. V. Bokov understands as follows: "A route, a border, a street, a crossing, a corner, gates are the result of viable human activities, the most efficient instruments of the landscape arrangement, in addition provided by the nature in the similitude of rivers, coastlines, deer paths, natural borders of expansion of representatives of fauna and flora, specific areas, landmarks and so on" [9].

The primary categories of the cultural landscape exist as archetypes in human consciousness; they determine both fundamental instincts and the strategy of behavior. As a consequence of different combinations of main categories of the cultural landscape all its diversity is developed and a real framework of its further development is formed.

The categories of the cultural landscape laid the foundation for further development of the human environment and formation of the townscape.

2.2. Structural Elements and Main Functions of the Townscape

The townscape is a complex multiple-aspect system including both natural and artificial components. For a detailed study of the townscape it is required to separate out structural elements both of natural and anthropogenous nature from a general concept.

The following elements may be attributed to the structural elements of the townscape being of anthropogenous nature:

- buildings, engineering constructions;
- main transport routes, streets, trafficways, blind passes;
- crossings, road junctions;
- city squares, courts of honour, squares in front of separate buildings;
- courtyards, block areas;
- artificial planting of trees and shrubs;
- boulevards, squares, quays;
- town design, advertisement, small architectural forms.

The following elements shall be attributed to natural structural elements of the townscape:

- various types of relief;
- water-parting lines;
- territories with various soils;
- areas with natural landscaping;
- water bodies.

The whole variety of urban environment variants is formed of the structural elements like of the alphabetic letters, and the quality and comfort of the townscape depends on the quality of its composing structural elements to a large extent.

The distinguished structural elements being a part of a general system at the same time seem to be a complex multidimensional multifunctional structure and rather than something elementary. As Camillo Sitte, a noted Austrian architectural theorist of the XIX century truly stated: “Artistically a simply open space is not yet a town square. Strictly speaking, in this regard, there is still much required — decoration, the signification, the individuality” [10]. Being one of recognized authorities in the area of theory of architecture C. Sitte expressed deep regret for the town planning which had lost artistic expression in favour of the adaptability to manufacture, the regularity and the simplicity.

As a phenomenon of the town planning art, it is required to study in depth each structural element of the townscape, to analyze historical development, classification and typology, to reveal artistic and functional aspects, to forecast prospects for further development. This is true in regard to buildings, streets, squares, courtyards, i. e. to all the structural elements of the townscape stated above.

At the same time the structural elements of the townscape are aimed to separate out the most important objects of the urban environment and to draw attention to them, to be landmarks, determine the hierarchy of urban space zones separating the main thing from the secondary one.

The townscape as an artificial living environment is destined to satisfy numerous increasing, and in accordance with the requirements imposed to the urban environment it must fulfill the following functions in compliance with the reference norms:

- social and town planning;
- transport and communication;

- artistic and aesthetic;
- psychophysiological;
- natural ecological;
- provision of security and orientation in its environment.

Each function of the townscape may be characterized as follows.

In the first instance the social and town planning function of the townscape resides in the necessity to cover the requirements of people proceeding from understanding local lifestyle, habits and traditions, age, national and group preferences, with this end in view sociological studies must be taken as a basis of the made urban planning solutions.

The transport and communication function of the townscape is to provide the shortest convenient, safe, ecologically clean communications both inside a homogeneous landscape and in a general structure of a city.

Establishment of a harmonious environment with high artistic and aesthetical properties is one of main functions of the townscape. To live in a beautiful aesthetical environment is the most ancient need of a man traced over the course of all the history of society.

A man as a biosocial creature has concrete psychophysiological attributes. For this reason the townscape is to conform to these attributes to the maximum, and town planning concepts and models are to be developed taking into consideration achievements of a new science — human ecology.

Physical and moral health of people depends on the level of performing a natural-ecological function. High ecological properties of the townscape are one of preconditions of its existence.

The function of providing security of human life and the orientation ability quickly and with ease in the townscape is attributed to the functions having been recognized by specialists relatively recently that does not make the problem less pressing.

On condition that the townscape fulfills its main functions the quality of an artificially established human environment will be provided ultimately.

3. Typology of urban landscape

Typology of urban landscape is determined according to the dominant character, depending on the functional purpose. Urban landscape includes city and its border territory. According to the functional purpose it is divided into the types of urban landscapes:

- agrarian landscape;
- industrial landscape;
- transport landscape;
- residential landscape;
- culture and historical landscape;
- recreational landscape;
- mixed landscape.

Each type of urban landscape is characterized by different levels and quality of features, structural elements and base categories.

3.1. Agrarian landscape

According to the last scientific data the agrarian landscape on an average occupies space equal to 25 % of the whole territory of the city. Agrarian landscape of the contemporary city represents the unity of four components: large agricultural lands, garden-farming patch of the citizens, garden suburb and estate buildings with the land allotment. In social and urban planning the agrarian landscape performs such functions as: industrial, recreational and ecological. Artistic and aesthetic side of the agrarian landscape in whole is favorable and in a greater degree depends on natural basis. Improvement of orientation of the agrarian landscape could be achieved by the indicators, clarifying signs and architectural dominants in the form of silos and water towers and the other elements.

3.2. Industrial landscape

Main features of the industrial landscape are determined by the type of industrial production and technology. Transport and communication functions of the industrial landscape play one of the leading roles. Artistic and aesthetic functions of the industrial landscape had not been given significant attention. That is why the industrial landscape is one of the most nonfavorable.

Industrial landscape of the modern cities (post-Soviet historical period) represents an environment with one of the most non-favorable ecological situations and lowest number of natural elements. Solution of many problems of organization of the industrial landscape primarily depends on the development of modern harmless and non-waste technology. It will directly influence on the aesthetic, transport and communication, ecological features of the industrial landscape

3.3. Recreational landscape

Recreational landscape is a traditional place of the rest of citizens. Transport and communication linkages in the recreational landscape in a greater degree are a place for walk and communication. Paths, trails, alleys, connecting the separate elements of landscape, bear a considerable decorative and aesthetic load. Well organized recreational landscape possesses high artistic and aesthetic features. Elements of nature (relief, green belt, reservoirs) the most harmoniously are tied with the elements of small architecture (playgrounds, decorative arbours, sculptures etc.). Interesting specific images, perspectives, views, colour and mood change strike aesthetic and emotional chord. Recreational landscape is one of the few landscapes that meet the psychophysiological needs of human being. Lack of the right angles and bare planes with the single-type elements, contiguous harmonious range of colours, abundance of details and small elements correspond to the most comfortable mode of visual comprehension of the recreational landscape. This is considered to be the most favorable type

of landscape also from the ecological side. Fresh air, absence of dust, dirt, noise and minimal technogenic load on the recreational landscape create an optimal ecological situation. Recreation landscape occupies the territory with a strongly marked relief, including water systems, vast zones of natural and artificial greens in the city's structure.

3.4. Transport landscape

Transport-type landscape appears at significant concentrations of the elements related to the function of movement and transfer. Transport landscape contains the structural elements:

- railway — railway lines, railway stations, bridges, electric power lines, repair shops, depots, classifying sections;
- motor transport — multi-level cross couplings, highways, parking areas, roadside hotels, camping, motels, fuel stations, electric power lines;
- sea, river — ports, riverside stations, docks, repair shops, storages, bridges.

Total territory of the elements of transport landscape is up to 60 % of the whole territory of the city. Transport landscape is one of the most powerful sources of pollution in the form of smoke, dust, soot, fume, noise and the other harmful effects. This type of landscape represents the maximum concentration of technogenic elements and minimum of natural elements. Aesthetically, the transport landscape causes mixed feelings. On the one hand, the delicate shape of bridges, spectacular architecture of modern stations make a strong enough impression; on the other hand, there is a sad aesthetic situation on the territory contiguous to the railroad lines, storages and repair shops.

3.5. Culture and historical landscape

Cultural and historical landscape is the center of cultural and social life, as well as the epitome of national heritages. Its' formation is due to the intersection of the ancient ways, historically formed centers of crafts, trade and religious pilgrimage. Natural basis of cultural and historical landscape is presented by the fertile plain floods, dry, well-lit hills and rich floral massifs.

Artistic and aesthetic features of the landscape are a demonstrative example of the forms' harmony, rich plastic of the facades, and chamber urban planning scale. Use of volumetrically space compositional techniques in the formation of architectural dominants, beautiful prospects and frequent change of images and views leads to the creation of a general atmosphere of emotional and aesthetic satisfaction. Historical environment creates a feeling of comfort, security, psychological comfort, thus serves to a number of human contacts and communication, moral and aesthetic upbringing. Ecological situation in historical building conditions in most cases is favorable.

3.6. Residential landscape

Residential landscape occupies maximum area of the total territory of urban landscape. There could be identified four types of building:

- historical building;
- model building of the 60–80th years;
- modern building of the 90th years;
- private, industrial sector of building.

We can classify the mansions, palaces and commercial apartment buildings of the XIX century to the residential landscape formed by the historical building. This type of landscape in most cases according to its features and qualities is the most favorable. Modern residential building is comfortable and aesthetical enough; many of the necessary requirements for the residential environment are taken into account. Urban landscape formed by a model industrial building can be described as in-harmonious and unfavorable. Social and urban planning function of the model residential landscape is designed to solve the housing problem rapidly and at a short time. That is why the problems of standardization and unification became the fore issue. In most cases, construction was carried out without regard to the specific climatic conditions of the built-up areas. Monotony, sameness, faceless, gray range of colours, poor quality of construction and finishing works are dominating. A large number of homogeneous and aggressive fields make unfavorable psychophysiological impact on human being. There are few greens, but a lot of concrete and asphalt, storm drainage is poorly organized. Non-tight building is blown by the winds.

Another type of residential landscape is an individual, private building. It is also divided according to the time of construction — at the beginning of the XX century and at the end of the XX century. In the early and mid-century, there were built mostly one-story houses, houses of unpretentious forms with small plots of land. At the present, we are talking about the residential landscape, represented in two, three-story cottages, built on individual projects.

These types of residential landscape are in need of measures of its harmonization.

3.7. Mixed landscape

You may not always identify the typology of the urban landscape. In many cases it is of the mixed type of two or sometimes three different types of landscape. Mixed type of landscape can strengthen or weaken its quality depending on the combination with favorable or non-favorable landscape views. For example, in the industrial and residential, transport and residential types of landscapes the features of the territory in the most cases get worse because of the close placement to the industrial and transport facilities. There is worse environment; there are undeveloped natural landscape components, and aesthetic quality is weaker in comparison with the other types of urban landscape. In case

where there is a mixed type of landscape, such as recreational and residential, agricultural and residential, etc., the general features of the landscape are more favorable, while in case of transport and industrial, agricultural and industrial landscape there is maximum number of technogenic elements.

Conclusion

Landscape and ecological approach to the formation of urban space allows analyzing the natural and urban landscapes as holistic constitutions with regard to the laws of nature and cities development. Urban landscape is a synthesis of natural and artificial landscape, where these two components are in close interrelation, interaction and mutual influence.

1. Urban landscape is under influence of many factors, such as: social and economic, natural and ecological, scientific and technical as well as architectural and artistic factors.

2. For more detailed study of the processes happening in the urban landscape it is expedient to separate some components in the concept — “urban landscape”: hierarchical levels, base categories, structural elements. In order to introduce the system in the form of the simple structures, applying scientific methods of landscape science and urban planning.

3. Humanization and harmonization are the main trends in formation of the urban landscape and are based upon “the model norms of environment”, allowing to solve the problem of organization and regulation of artificial human environment, taking into account the whole complex of its psychophysiological and social needs.

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